Task 2

Algorithm: Random

Program: simpleloop

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	71.6867	7616	3008	2958	368	2590
100	73.8611	7847	2777	2677	178	2499
150	74.3788	7902	2722	2572	135	2437
200	74.3976	7904	2720	2520	133	2387

Program: matmul

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	65.5484	1893157	995027	994937	955806	39171
100	88.7673	2563763	324421	324321	317043	7278
150	96.6547	2791566	96618	96468	94259	2209
200	98.0337	2831394	56790	56590	55078	1512

Program: blocked

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	99.6579	2410008	8272	8222	5837	2385
100	99.7846	2413071	5209	5109	3510	1599
150	99.8195	2413916	4364	4214	2865	1349
200	99.8404	2414420	3860	3660	2446	1214

Program: interesting (my program)

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	30.1833	18110	41890	41840	890	40950
100	31.7117	19027	40973	40873	405	40468
150	32.2100	19326	40674	40524	267	40257
200	32.3700	19422	40578	40378	209	40169

Algorithm: FIFO

Program: simpleloop

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	72.0793	7675	2973	2923	202	2721
100	74.0702	7887	2761	2661	44	2617
150	74.4459	7927	2721	2571	16	2555
200	74.5210	7935	2713	2513	12	2501

Program: matmul

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	60.9702	1760932	1127252	1127202	1083212	43990
100	62.4834	1804637	1083547	1083447	1061222	22225
150	98.8086	2853775	34409	34259	32943	1316
200	98.8267	2854296	33888	33688	32433	1255

Program: blocked

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	99.7345	2411859	6421	6371	4232	2139
100	99.8220	2413975	4305	4205	2847	1358
150	99.8260	2414071	4209	4059	2756	1303
200	99.8692	2415117	3163	2963	1985	978

Program: interesting (my program)

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	30.3817	18229	41771	41721	837	40884
100	31.7383	19043	40957	40857	400	40457
150	32.1733	19304	40696	40546	266	40280
200	32.4100	19446	40554	40354	195	40159

Algorithm: LRU

Program: simpleloop

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	73.8636	7865	2783	2733	87	2646
100	74.7370	7958	2690	2590	2	2588
150	74.7652	7961	2687	2537	0	2537
200	74.7652	7961	2687	2487	0	2487

Program: matmul

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	63.9490	1846965	1041219	1041169	1040063	1106
100	65.1527	1881729	1006455	1006355	1005274	1081
150	98.8614	2855298	32886	32736	31656	1080
200	98.8618	2855310	32874	32674	31594	1080

Program: blocked

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	99.7879	2413150	5130	5080	2745	2335
100	99.8435	2414495	3785	3685	2603	1082
150	99.8441	2414511	3769	3619	2558	1061
200	99.8472	2414584	3696	3496	2435	1061

Program: interesting (my program)

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	32.9650	19779	40221	40171	53	40118
100	33.0633	19838	40162	40062	0	40062
150	33.0633	19838	40162	40012	0	40012
200	33.0633	19838	40162	39962	0	39962

Algorithm: CLOCK

Program: simpleloop

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	73.7697	7855	2793	2743	94	2649
100	74.7183	7956	2692	2592	3	2589
150	74.7558	7960	2688	2538	0	2538
200	74.7558	7960	2688	2488	0	2488

Program: matmul

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	63.9488	1846959	1041225	1041175	1040067	1108
100	65.3141	1886390	1001794	1001694	1000612	1082
150	98.6044	2847877	40307	40157	39076	1081
200	98.8613	2855296	32888	32688	31608	1080

Program: blocked

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	99.7628	2412545	5735	5685	3251	2434
100	99.8290	2414144	4136	4036	2610	1426
150	99.8436	2414499	3781	3631	2570	1061
200	99.8676	2415078	3202	3002	1941	1061

Program: interesting (my program)

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	32.9583	19775	40225	40175	54	40121
100	33.0567	19834	40166	40066	3	40063
150	33.0617	19837	40163	40013	0	40013
200	33.0617	19837	40163	39963	0	39963

Algorithm: OPT

Program: simpleloop

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	74.8591	7971	2677	2627	26	2601
100	75.2066	8008	2640	2540	0	2540
150	75.2066	8008	2640	2490	0	2490
200	75.2066	8008	2640	2440	0	2440

Program: matmul

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	79.6599	2300725	587459	587409	586322	1087
100	96.7870	2795387	92797	92697	91612	1085
150	99.0785	2861570	26614	26464	25379	1085
200	99.3330	2868920	19264	19064	17979	1085

Program: blocked

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	99.8472	2414584	3696	3646	2560	1086
100	99.8760	2415282	2998	2898	1825	1073
150	99.8957	2415757	2523	2373	1297	1076
200	99.9060	2416007	2273	2073	1007	1066

Program: interesting (my program)

Memory Size	Hit Rate	Hit Count	Miss Count	Overall Evictions	Clean Evictions	Dirty Evictions
50	33.1200	19872	40128	40078	34	40044
100	33.2267	19936	40064	39964	20	39944
150	33.3100	19986	40014	39864	20	39844
200	33.3933	20036	39964	39764	20	39744

Comparison of Algorithms

OPT, with its ability to perfectly predict the future, exhibits the highest hit rates. Quite intuitively, this is because

each time it evicts the *best possible* page with respect to its future reference(s).

The hit rates obtained using LRU and Clock are very similar for all the programs. This is likely because that the algorithms themeselves are quite alike, with Clock just acting as a lesser accurate version of LRU.

Rand has shown lower hit rates on average. However, it did have higher rates when used by `matmul`. This is because of `matmul`'s nature of memory access - which largely follows an ordered pattern, in which the recently accessed memory locations are less likely to be accessed again.

Lastly, and on a more general note, hit rates increase with memory size for all algorithms. Intuitively, as more pages are kept in memory, there is a greater opportunity of benefitting from temporal locality, and hence page faults become less likely to occur.

LRU Behaviour with Increasing Memory Size

As with the other alogorithms, the hit rates increase with memory size. This is because as memory size increases, LRU is able to hold a larger record of recently used pages, and hence, on each evction, the page that was least recently used is even less likely to be referenced again. Therefore, we can see that LRU is able to maximize benefits from locality as it is given a higher memory size.